# Claims

1. A method for separating and measuring $^{37}Ar$ quickly from a soil gas sample or an atmospheric sample, which comprises the following steps in turn:

1) sampling, which comprises collecting soil gas sample or directly collecting atmospheric air with a syringe sampler;

2) eliminating impurities, which comprises passing the gas sample as collected through a room temperature molecular sieve column to eliminate $H_2O$ and $CO_2$, and through a room temperature deaerator to eliminate $O_2$;

3) separating, which comprises allowing the gas sample after eliminating impurities to be adsorbed by entering a sampling column positioned in a cold trap at a temperature from -170°C to -185°C, and then washing the sampling column with a He gas stream, whereby a majority of Ar and partial $O_2$ and $N_2$ at the front end of the sampling column are carried by the He gas stream to enter a molecular sieve collection column in a liquid nitrogen cold trap;

4) purifying, which comprises taking the collection column out of the cold trap, and washing it with a He carrier gas stream after heating, whereby Ar, $O_2$ and $N_2$ are detached from the collection column before entering a separation column in a chromatographic system at a temperature from -20°C to -70°C for chromatographic separation; allowing the gas after separation to enter a room temperature catalytic deoxidizing column, whereby eliminating trace $O_2$ that is inseparable from Ar and further purifying Ar; then, allowing the gas after purification to be analyzed by entering a thermal conductivity detector;

5) measuring the sum of Ar, which comprises measuring the sum of Ar as collected with the thermal conductivity detector;

6) collecting Ar, which comprises collecting Ar in tail gas out of the thermal conductivity detector with an activated carbon collection column positioned in a liquid nitrogen cold trap (i.e., preparative chromatography), heating the activated carbon collection column, and collecting Ar gas as desorbed with a proportional counter; and

7) measuring the activity of $^{37}Ar$, which comprises filling the proportional counter with a working gas methane in a ratio of $Ar/CH_4$ = 9:1, and measuring the activity of radioactive $^{37}Ar$ after thoroughly mixing the two gases.

2. A system for separating and measuring $^{37}Ar$ quickly used in the method according to claim 1, which comprises a sampling unit for sampling the gas to be measured; a separating-purifying unit for separating-purifying-extracting the gas to be measured and for measuring the production of Ar; a measuring unit for measuring the radioactivity of $^{37}Ar$ gas as extracted; and a control unit for controlling the working process of the above three units by using a computer and a software; wherein, the sampling unit, the separating-purifying unit, and the radioactivity measuring unit are connected in turn, and the control unit is connects respectively to the sampling unit, the separating-purifying unit, and the radioactivity measuring unit.

3. The system for separating and measuring $^{37}Ar$ quickly according to claim 2, characterized in that the sampling unit comprises a syringe sampler (1) for collecting soil gas, a room temperature molecular sieve dehydration column (5) for eliminating $H_2O$ and $CO_2$, a room temperature deaerator (6) for eliminating $O_2$ from the collected gas, and a sampling column (7) positioned in a low temperature cold trap for collecting gas and primarily separating Ar by the virtue of temperature difference.

4. The system for separating and measuring $^{37}Ar$ quickly according to claim 3, characterized in that the syringe sampler (1) is made from metal or alloy tube, wherein the needlepoint part is conical with pinholes closely distributed on its surface, the end part of the syringe sampler is sealed, and a pipeline joint is positioned near the end part of the syringe for connecting a aspirator pump.

5. The system for separating and measuring $^{37}Ar$ quickly according to any one of claims 2-4, characterized in that the separating-purifying unit comprises a molecular sieve collection column (8) positioned in a liquid nitrogen cold trap for concentrating Ar and part $N_2$ as well as trace $O_2$, a preparative chromatographic system, a proportional counter (11) for collecting $^{37}Ar$ and measuring its radioactivity, a He carrier gas source (16) for a thermal conductivity detector of preparative chromatography, and a methane working gas source (15) for measuring the radioactivity of $^{37}Ar$, which are connected in

turn; wherein, the preparative chromatographic system consists of a chromatographic separation column (9) for separating Ar and $N_2$, a room temperature catalytic deoxidizing column (12) for eliminating trace $O_2$, a thermal conductivity detector (14) for further purifying Ar and measuring the sum of Ar, and an activated carbon collection column (10) for collecting chromatographic pure Ar, which are connected in turn.

6. The system for separating and measuring $^{37}Ar$ quickly according to any one of claims 2-5, characterized in that the radioactivity measuring unit consists of a proportional counter, a shield and an electronics system.

7. The system for separating and measuring $^{37}Ar$ quickly according to any one of claims 2-6, characterized in that the control unit uses the computer and the software, wherein the software has the following functions:

initializing the system;

collecting and processing the relevant sensor signals, chromatographic detector signals and radioactivity measuring information, and giving data results;

conducting on-off control on electromagnetic valves in the system; and

presetting, modifying, real-time displaying and transfinite alarming with respect to all signal parameters inputted into the sensor.